

Cushioning and Rolling Resistance in Healthcare

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Keith Gray MS.

Director of Technical Marketing, The Mohawk Group

KARASTAN

LEES

Bigelow

 DURKAN

Floor Cushioning vs. Rolling Resistance

Is it possible to choose flooring that will decrease daily fatigue of employees but not increase the difficulty of moving heavy hospital beds?

As the healthcare industry faces an increasing number of patients and a decreasing population of caregivers, healthcare flooring is often selected to

prevent, for example, plantar fasciitis or “heel spurs,” a growing problem for nurses according to Nurse Week. Low-rolling resistance is often sought through the use of hard-surfaced flooring to prevent lower back and leg injuries often attributed to pushing heavy hospital beds over soft, compliant flooring. But systems optimized for one, almost always compromise the



optimize two conditions: maximum-underfoot comfort and/or minimum-rolling resistance to prevent lost-time injuries. Comfort is often sought through cushioned flooring or “anti-fatigue” surfaces, to

other. Ideally, flooring selection will strike a balance between the two. Currently, ergonomic standards related to floor-cushioning properties and pushing/pulling rolling loads are essentially non-

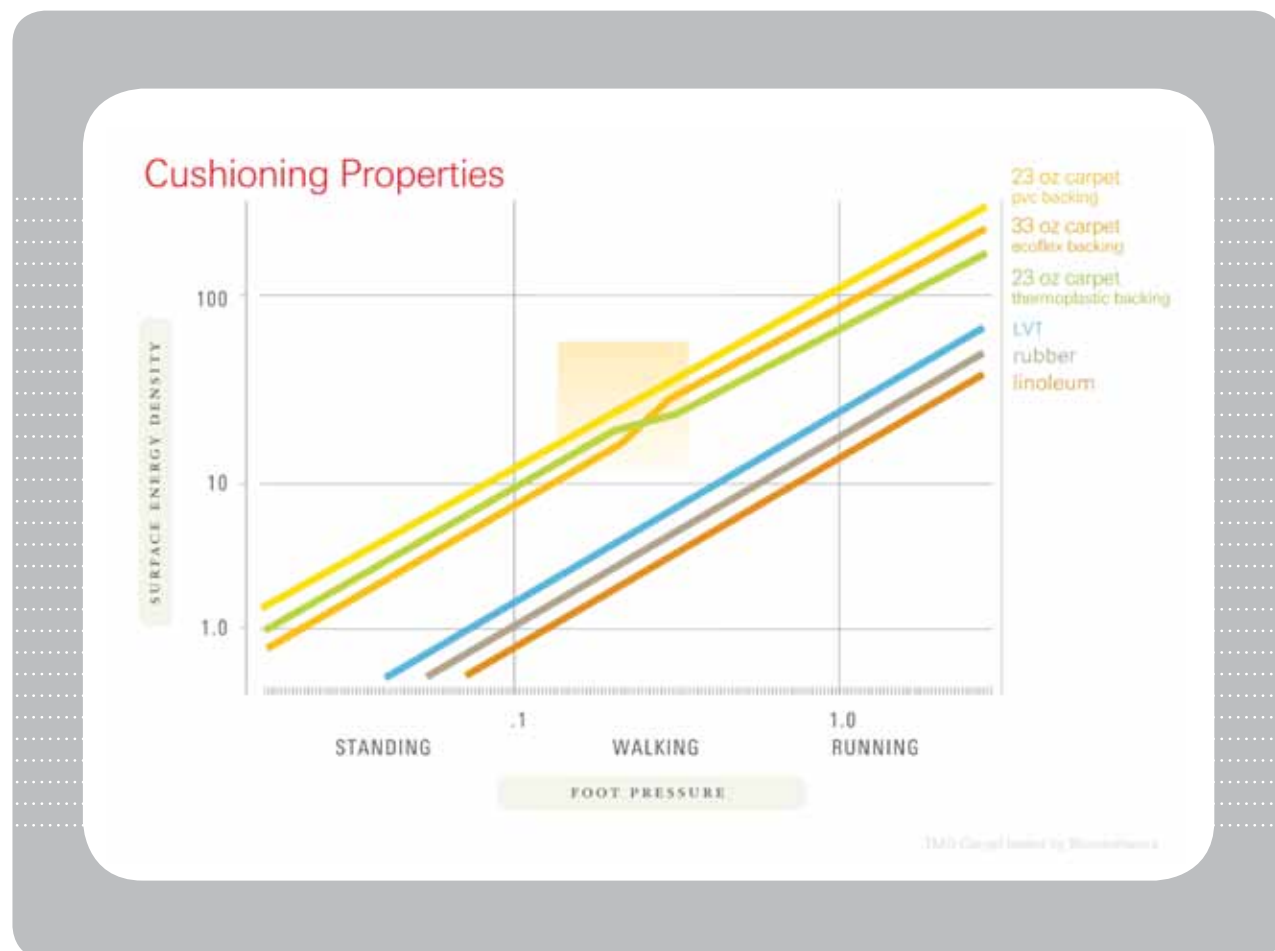
existent in healthcare design. It's not surprising that U.S. Bureau of Labor Statistics reports healthcare professions as having the second highest rate of on-the-job injuries of all major U.S. job categories. The healthcare industry could benefit from a better understanding of floor cushioning and rolling-resistance properties, and how one affects the other.

Cushioning our Caregivers

There is no general agreement on tests for determining cushioning properties of healthcare flooring. Various tests are used by different flooring manufacturers. While some claim "anti-fatigue" performance, none can accurately relate their results to human performance. One reliable test used by top athletic footwear companies is compressive force displacement testing

to screen anti-fatigue properties. This test measures the approximate compressive modulus of a material and surface-energy density as a function of foot pressure. As interpreted by qualified biomechanics experts, it speaks directly to the relationship between floor cushioning and medical conditions, such as heel spurs. The following are the results of testing several types of flooring often used in acute and long-term care facilities, conducted by an independent biomechanical consulting firm.

These findings show that certain types of luxury vinyl tile, rubber flooring and linoleum flooring that claim to be "anti-fatigue" may not necessarily meet those criteria. Also shown are results for a carpet with a thin attached urethane cushion, which possesses good anti-fatigue



performance. But the results further show that certain carpet products, which might not be thought to have useful cushioning, actually do. Two of the carpet examples shown (PVC-backed and thermoplastic-backed) have low-compression, uncushioned-performance backings. Properties of the backing (density and thickness) and face fiber create useful anti-fatigue properties. This substantiates that cushion is not necessary for comfort when it comes to carpet. This is important, since, as will be shown, cushion backed carpet has a generally negative effect on rolling resistance.

Reducing Rolling Resistance

Today there is no standardized test method available for measuring hospital bed rolling resistance. To augment this, a few

of the largest hospital bed manufacturers developed their own in-house testing methods to evaluate rolling resistance. With no official test in existence, it is not surprising that the manufacturers' interpretations of what level of rolling resistance is acceptable differ significantly. In fact, one manufacturer's maximum limit for rolling resistance is double that of the other. And neither relates rolling resistance to human performance. The chart noted below was created based on the tests bed manufacturers were using in late 2004.

To assure meaningful results, the rolling system (bed plus simulated patient) has a total weight of 950 pounds and employs real hospital bed casters. The graph below shows typical results of rolling-resistance testing of four flooring products: hard



surfaces (vinyl, rubber, ceramic etc.) and three types of carpet. It's easy to say that under most conditions, the harder surfaces often have the lowest rolling resistance.

But contrary to some thinking, all carpet is not alike when it comes to rolling resistance. And within the range of carpet face weights best suited to be installed in healthcare facilities (18 – 23 ounces per square yard), particularly in corridors on nursing units, carpet with a non-cushioned performance backing can come to within a few pounds of the rolling resistance found on hard surfaces.

While data like the above is often a revelation to facility managers, allowing flooring selection based on low-moderate-high rolling resistance as shown above, the more important question is, "How much can we expect from our caregivers?" It is puzzling that NIOSH-recommended guidelines (www.libertymutual.com search: Manual Materials Handling Tables) for certain manual tasks such as pushing rolling loads, are not enforced or even known in most healthcare systems.

Applying these results to these guidelines shows that about 49 percent of women, who make up the majority of bedside care providers, could be expected to perform the initial push on either the hard-surface flooring or performance-backed carpet, whereas only about 12 percent of women could be expected to do the same on the cushion-backed carpet with the highest rolling resistance. Given this data, one New York hospital risk manager asked me "What are we doing to the other 51% and 88% of our people?"

This suggests that even under the best conditions, pushing a hospital bed is a physically challenging task, and is likely to contribute to work-related injuries.

Considering both studies, the ideal flooring system to achieve both anti-fatigue performance and low-rolling resistance is modular or broadloom carpet with a dense, non-cushioned PVC or thermoplastic performance backing.